

Application For United States Letters Patent

For

Ejecting Compact Disk Case

Invented by

Peng-Chen Kung

### Field of the Invention:

The present invention relates to a case, and in particular to a case for storing compact disks which is adapted for simple ejection of the disk from within, and which is inexpensive to manufacture and uses a minimal number of components.

### Background and Objects of the Invention:

Numerous cases for transporting and storing compact disks exist in the prior art. These primarily fall into two categories, those that are openable to remove the disk from within, and those which are adapted to eject the disk from within.

Openable cases tend to be difficult to open, requiring the use of both hands and some dexterity to open the case and remove the disk. These cases are generally made of plastic and have delicate hinges and integrally molded snaps to hold the disk closed. These hinges and snaps tend to fail after repeated openings and closings. Young children and the elderly often find it particularly difficult to apply the necessary force to open these types of cases.

Most ejecting cases such as that disclosed in US patent 5676246 are generally adapted to remain closed,

while having an always-opened side and an actuator that engages movable components, which forces the disk fully or partially from within through the open side. Such cases of this type from the prior art tend to be complicated and clumsy, and the open side allows dust and debris to enter and do damage to the delicate surfaces of the disk. Such prior art cases are also flawed in that they tend to not provide sufficient ejection of the disk from the case, and they do not provide adequate leverage through the actuator to allow a child or older person to comfortably eject the disk as intended. When the disk is not fully ejected, the user is inclined to grasp the disk and remove it from the case by pinching it at its delicate information-storing areas, thereby damaging the disk. Whereas, if the disk could be properly ejected, the peripheral edge of the disk could be grasped by a thumb and forefinger on opposite sides, without touching the information storing area of the disk.

Other prior art cases do not support or guide the disk at its peripheral edge or are relatively expensive to manufacture. Cases such as those disclosed in US patents 5244084 and 5425450 swing the entire disk through an arcuate path during ejection that requires the case to be larger than needed for storing the disk.

The present invention seeks to provide a case which can safely and compactly store objects such as compact disks in a fully closed and protected state, yet which is adapted with a simple and reliable ejection mechanism, having only a single moving component that is adapted to maximize the leverage needed for full ejection of the disk through a side that becomes open by the same motion which ejects the disk. Further, the pulling motion which would be natural to pull the disk from the case is mimicked to simultaneously engage the actuator, uncover the opening, and eject the disk, and the same motion which would be natural to reinsert the disk is mimicked to simultaneously return the disk to the case and close the opening. Still further, the disk is forced from the case along a straight path that allows the case size to be minimized.

Further advantages of the present invention will become apparent upon review of the following.

#### Summary of the Invention:

According to a first aspect of the present invention, there is provided a case having a substantially rigid housing comprised of two side panels and at least two edge walls for surrounding and containing a compact disk.

Additionally, a rigid C-shaped ejector, sized to partially

surround the compact disk's peripheral edge, is disposed within the housing and adapted to swing relative to the housing about an integral pivot that connects the housing to the ejector. The ejector is adapted so that a portion thereof covers the open front edge of the housing when the ejector is in its "closed" state, and that portion also serves as a manually operable lever to actuate the ejection of the disk from the housing as it simultaneously exposes the open front edge of the housing. During this actuation, another portion of the ejector that is disposed within the housing and behind the disk from the opening, forces the disk from the housing, through the exposed opening, along a straight line path that is parallel to the top and bottom walls of the case, so that the case needs to be almost no taller than the disk itself.

As can be readily appreciated, the covering of the open edge of the housing protects the disk from dust and debris when stored within the case, and prevents such dust and debris from entering the case even when it is empty, so long as the ejector is returned to its closed state.

The invention also provides exceptional reliability, ease and economy of manufacture, and ease of use, in most part because the ejector is a single component and is the only moving and moveable component of the case.

In one embodiment of the invention, the housing and ejector are each molded of a single plastic component, so that this embodiment is comprised of a total of only two components. In this embodiment, the housing is molded in an open "clamshell" state and is folded at a molded-in living hinge to capture the ejector about the pivot and to then snap permanently shut, forming the entire case in just a single step.

Because a compact disk comprises faces on which digital information is stored and through which that information is optically read, it is critical to any compact disk case that these faces are not scratched by contact within the case. The outer periphery and the center hub of the disk are left void of such information and are preferably the only part of the disk that is contacted during use and storage. Preferably, the housing and ejector of the present invention are adapted to contact the disk only at this peripheral edge. In the preferred embodiments, the housing and ejector are adapted with channels in which the peripheral edge of the disk sits and slides, to guide and locate the disk so that the susceptible inner faces are not allowed to contact the case. Preferably, the ejector is arranged to force the disk sufficiently from the housing along a substantially

straight line that is parallel to the top and bottom walls of the housing so that the case size can be minimized and the disk can be grasped by a thumb and forefinger at substantially opposite peripheral edges to avoid pinching the disk at its information-storing area.

Description of the Drawings:

FIG 1 is an exploded perspective view of the as-molded components of a plastic case according to the preferred embodiment of the invention prior to assembly.

FIG 2 is a perspective view of the components of FIG 1, wherein the right side panel of the housing is being swung towards the closed state about the molded-in living hinge at the housing's top wall.

FIG 3 is a perspective view of the fully assembled case of FIG 1 with the ejector in its storage position.

FIG 4 is a perspective view of the case of FIG 4, wherein the right side panel is shown swung partly opened to show the ejector in its storage position, holding a compact disk within.

FIG 5 is a the same view as shown in FIG 4, except that the ejector has been pivoted outwardly and the disk is being ejected.

FIG 6 is a partial cross-sectional view through the living hinge at the top wall of the case of FIG 4, taken at Line 6-6 of FIG 4 except with the case fully closed as in FIG 3, and showing how the closing of the case creates a channel at the top wall for supporting and guiding the disk at its peripheral edge.

FIG 7 is a partial cross-sectional view through the ejector, taken at Line 7-7 of FIG 4, showing the ejector's channel for supporting and guiding the disk at its peripheral edge.

Fig 8 is a partial cross-sectional view through the snapped-together bottom wall of the case of FIG 4, taken at Line 8-8 of FIG 4, and showing the channel created there-at for supporting and guiding the disk at its peripheral edge.

FIG 9 is a side view of a wooden case according to a second embodiment of the invention, having a portion of its right side panel broken away for a view of the ejector and disk inside.

FIG 10 is a full side cross-sectional view of the case of FIG 9 (without the side panel broken away), taken at Line 10-10 of FIG 9, and showing the disk held by the channels within.

FIG 11 is a partial cross sectional view of the front wall of the case of FIG 9, taken at Line 11-11 of FIG 9,



and showing the actuator portion of the ejector that is grasped and pulled by the user for ejecting the disk.

FIG 12 is a side view of the case of FIG 9 during ejection of the disk, having a portion of its right side panel broken away for a view of the ejector and disk during said ejection.

Detailed Description of the Preferred Embodiments:

The two most preferred of the many potential embodiments of the present invention are shown in the accompanying drawings. FIG's 1 through 8 disclose a preferably plastic compact disk storage case 100, and FIG's 9 through 12 disclose a preferably wooden compact disk storage case 200.

Referring first to FIG's 1 through 8, a case 100 for storing compact disks is shown. An injection-molded housing 102 is preferably made of a transparent plastic such as polypropylene, which has characteristics that are favorable for use in living hinges, has reasonable impact resistance, and is relatively inexpensive. The housing comprises a rectangular right side panel 104 and a rectangular left side panel 106 which are each connected to a top wall 108 by living hinges 110A and 110B, which are integrally-molded with the housing. The side panels 104 and 106 and top wall 108 are originally molded on a single plane as shown in FIG

1, but are folded relative to each other at the hinges in a "clamshell" fashion, as seen best in FIG 2, until the side panels are snapped together and into a position wherein they are parallel to and spaced from each other, as best seen in FIG's 3 and 6. The panels snap together by way of snap arms 112A and 112B, which extend from the right side panel 104, and which engage snap slots 114A and 114B respectively, as the side panels are forced together. Bottom wall 116 and rear wall 118 both extend from the left side panel 106 to keep the side panels apart, and to form a rectilinear Space 124 within the case 100 when the case is snapped together. Space 124 is sized and shaped to receive and store a compact disk, such as 126.

The connection of the side panels 104 and 106 is generally intended to be permanent, but in this embodiment, the snap arms 112A and 112B can be disconnected from the snap slots 114A and 114B and the case can be reopened for cleaning and such. Otherwise, the snap arms and snap holes may be replaced with any usual fastening means, such as screws, hot-staking, or ultrasonic welding.

Ejector 130 is preferably molded of a rigid plastic. The ejector consists of a base arm 132, back arm 134, and front arm 136, all rigidly connected to form a C-shaped member that is sized to surround three quarters of the

compact disk and to fit between the closed side panels 104 and 106 of the housing 102 and within storage space 124.

As the side panels 104 and 106 are folded together, the ejector is trapped within space 124, with pivot pin 142 extending up from the left side wall 106 adjacent to bottom wall 116, to fit loosely within pivot hole 144 of the ejector's base arm 132. The ejector is thus adapted to pivot back and forth about the axis of pivot pin 142, within the confines of the housing 102, to thereby move the compact disk 126 back and forth between a storage position, shown in FIG 4, and an ejected position, shown in FIG 5.

It should be noted that the right side panel 104 is shown partly opened in FIG's 4 and 5 for illustrative purposes only, but would actually be closed into the position shown in FIG 3 when the disk is stored and ejected.

A plurality of channel arms 146 extend from the left and right side panels 104 and 106 to support and guide the compact disk at its peripheral edge. The height and position of these arms are selected so that when the side panels are closed together, the arms form channels which engage the peripheral edge of the disk to hold it loosely within the center of space 124 and to guide it from space 124 during ejection, so that the center area of the disk,

where delicate digital information is stored, is not scratched. The inwardly directed surfaces of the ejector's base arm 132, rear arm 134, and front arm 136 also include channels 148, which lie on the same plane as the channels formed by channel arms 146 of the housing. As the ejector 130 rests in its storage position, as shown in FIG 4, the compact disk 126 lies also on this plane and fits loosely within the channels, which contact the disk only around its peripheral edge.

The axis of pivot pin 142 is disposed near to the rear wall 118 and rear arm 134 and adjacent to bottom wall 116. To pivot the ejector and thereby eject the disk 126 from the case 100, one grasps the front arm 136 of the ejector and swings it outwardly towards the position shown in FIG 5. As the ejector 130 pivots about the axis of the pivot pin 142, rear arm 134 is forced against the rear portion of the compact disk's peripheral edge and thereby forces the disk towards the opening 150 that is made available at the forward side of the case 100 as the front arm 136 moves away from that front side. The aforementioned position of the pivot pin 142 and position of the channels formed by the channel arms 146 of the housing allow the disk to travel in a straight line as it moves. The disk free to exit from the case 100, and is forced from the opening 126,

at the same time. The disk can then be grasped at its exposed peripheral edges and fully removed from the case.

It should be readily appreciated that the compact disk can be returned to the case in a reversal of the above procedure, and that, with the disk within the case and without, the closure of ejector back into its storage position cause the front arm 136 to seal the front opening 150 and prevent dust and debris from entering the storage space 124 and inadvertently damaging or dirtying the disk.

Stopper 152 is adapted to retain the ejector from being pivoted beyond the desired ejecting position, so that the disk is properly received when it is returned to the opened space 124.

Referring next to the case 200 of FIG's 9 through 12, a housing 202 is comprised of a rectangular right side panel 204 and a rectangular left side panel 206, each preferable made of a decorative wooden material or a reasonable rigid material covered by a decorative wooden veneer. A top wall 208, a rear wall 218, and a bottom wall 216, all preferably made of wood, are disposed between the side panels to maintain the panels in a parallel spaced relationship, creating a storage space 224 there-between which is sized and shaped to accommodate a compact disk 126. An ejector 230, similar in most respect to the ejector

130 of the first embodiment except herein preferably made of wood, is loosely trapped within space 224 as the side panels and walls are rigidly fixed together by glue, screws, nails, or any such traditional fastening means. The ejector is comprised of similar base, back and front arms, 232, 234, and 236 respectively, and is pivotal about the axis of pivot pin 242, which extends between the side panels and loosely fits within pivot hole 234 of the ejector's base arm 232.

The inwardly-facing surfaces of walls 208, 218 and 216, and the inwardly-facing surfaces of arms 232, 234, and 236, are all adapted with coplanar channels for supporting and guiding a compact disk, which sits loosely with space 224 and on the same plane with the channels so that only the channels are in contact with the compact disk, and only at the disk's peripheral edge.

Once assembled. The function of this case 200 is identical to that of the case 100 of the first embodiment, so no further recitation of those functions will be made here. Features for this embodiment that are not exhaustively described in this specification are assigned like numbers in the 200's in FIG's 9 through 12 as were assigned in the 100's in Fig's 1 through 8 for the first embodiment.

It should be readily appreciated by those of ordinary skill in the arts relative to this invention that numerous variations and permutations are possible while keeping within the intent of this invention, and that only the language of following claims, including equivalents thereto, should be used to gauge the scope of the invention and the rights entitled to the inventor therefore.